

**Final
Site Investigation
Site-Specific Field Sampling Plan,
Site-Specific Safety and Health Plan,
and Site-Specific Unexploded Ordnance Safety Plan
Attachments for Chemical Warfare Material Site
Training Area T-31, Parcels 184(7) and 185(7)**

**Fort McClellan
Calhoun County, Alabama**

**Delivery Order CK10
Contract No. DACA21-96-D-0018
IT Project No. 796887**

September 2000

Revision 1

**Final
Site Investigation
Site-Specific Field Sampling Plan for
Chemical Warfare Material Site
Training Area T-31, Parcels 184(7) and 185(7)**

**Fort McClellan
Calhoun County, Alabama**

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Revision 1

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See Attachment 1, List of Abbreviations and Acronyms.

Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Delivery Order CK10, IT Corporation (IT) will conduct sampling and analysis activities at the Chemical Warfare Material (CWM) Site, Training Area T-31, Parcels 184(7) and 185(7) at Fort McClellan (FTMC), Calhoun County, Alabama to determine the presence or absence of potential site-specific chemicals at this site. The purpose of this site-specific field sampling plan (SFSP) is to provide technical guidance for sampling activities at Training Area T-31.

The Training Area T-31, Parcels 184(7) and 185(7) is located in the north-central area of the Main Post. Training Area T-31 is located north of the Fill Area North of the Ammunition Supply Point (ASP), Parcel 230(7), and occupies approximately 12 acres. The site is in a valley bordered by Cemetery Hill to the west. This training area partly overlaps with historic firing ranges for 37 millimeter, small arms and machine guns. The site was used from 1957 to 1969 as a Technical Escort Reaction Area and currently has unrestricted access.

Training of Technical Escort personnel was reportedly conducted here using sarin (GB) and distilled mustard (HD) in quantities of 20 to 40 milliliters. Also, storage of unspecified CWM may also have occurred. The decontaminants supertropical bleach (STB) and decontamination solution No. 2 (DS2) may also have been used here. Based on observations of piles of white powder during a visit by U.S. Army Environmental Hygiene Agency in December 1973, it was surmised STB was used as a decontaminant for HD. When the chemical warfare training was deactivated in 1973, items used at the site were reportedly moved to Area T-38.

Two locations have been reported for Training Area T-31. Previous reports identify one area located at Parcel 184(7) and cite storage of CWM in Igloo 14 or in Igloo 13. The igloos are neither evident on the ground today, nor on aerial photos reviewed by the environmental baseline survey team. However, igloos are present at the ASP, located a short distance to the southeast. Long-time FTMC personnel report that CWM was stored in and dispensed from an igloo at the ASP, and from nearby Area T-38. Binary CWM components were stored in Building 4416 (also known as Igloo No.14, at the ASP).

Retired FTMC personnel also report conducting CWM exercises at a second site close to the previously reported location of Training Area T-31. This site is identified as Parcel 185(7). One report indicated that the training occurred in a previously unidentified area measuring

approximately 70 feet by 72 feet, but was not confirmed. The EBS team believed that details of the facility layout, location, and operations conducted at Training Area T-31 are in doubt and that activities associated with CWM training may have occurred at three areas. Two of the suspected areas are Parcels 184(7) and 185(7) at Training Area T-31 and the third is the ASP.

The site investigation (SI), conducted from 1991 through 1993 by Science Applications International Corporation, included a magnetometer survey over the site identified in historical records and site photography; however, no surface evidence of the former training area was visible. During the SI, the site was reported to be overgrown, but several pads and concrete structures were evident. The geophysical survey indicated metallic debris scattered within and beyond the site boundaries. This data suggests burial of some items at this location. The SI also included collection of soil, sediment, and surface water samples and field screening for CWM (HD and GB) and laboratory analysis for their breakdown products. Neither field screening for CWM and breakdown products, nor laboratory analysis detected any HD, GB, or degradation products in the shallow soil, sediment, or surface water samples.

The purpose of this SFSP is to provide technical guidance for sampling and analysis activities at Training Area T-31, Parcels 184(7) and 185(7). Specifically, IT will collect seven surface soil samples, seven subsurface soil samples, seven groundwater samples, four surface water samples, and four sediment samples at Training Area T-31, Parcels 184(7) and 185(7). Chemical analyses of the samples collected during the field program will include volatile organic compounds, semivolatile organic compounds, metals, and CWM breakdown products. In addition, sediment samples will be analyzed for total organic carbon and grain size. Results from these analyses will be compared to site-specific screening levels and ecological screening values presented in the IT July 1999 *Final Human Health and Ecological Screening Values and PAH Background Summary Report* and regulatory agency guidelines.

The field activities described in this SFSP will not be conducted until after U.S. Army Corps of Engineers (USACE)-Huntsville has completed the investigation of the CWM sites. If USACE-Huntsville determines there are other potential sources at the site, IT will collect additional samples to address these sources.

A USACE-Huntsville requirement for conducting work at CWM sites at FTMC is to use unexploded ordnance (UXO) anomaly avoidance techniques; therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at Training Area T-

31, Parcels 184(7) and 185(7). The surface sweeps and downhole surveys will be conducted to identify anomalies for the purpose of UXO avoidance.

This SFSP attachment to the installation-wide sampling and analysis plan (SAP) for Training Area T-31, Parcels 184(7) and 185(7), will be used in conjunction with the site-specific safety and health plan, the site-specific UXO safety plan, the installation-wide work plan, and the SAP. The SAP includes the installation-wide safety and health plan, waste management plan, ordnance and explosives management plan, and quality assurance plan. Site-specific hazard analyses are included in the site-specific safety and health plan and the site-specific UXO safety plan.

1.0 Project Description

1.1 Introduction

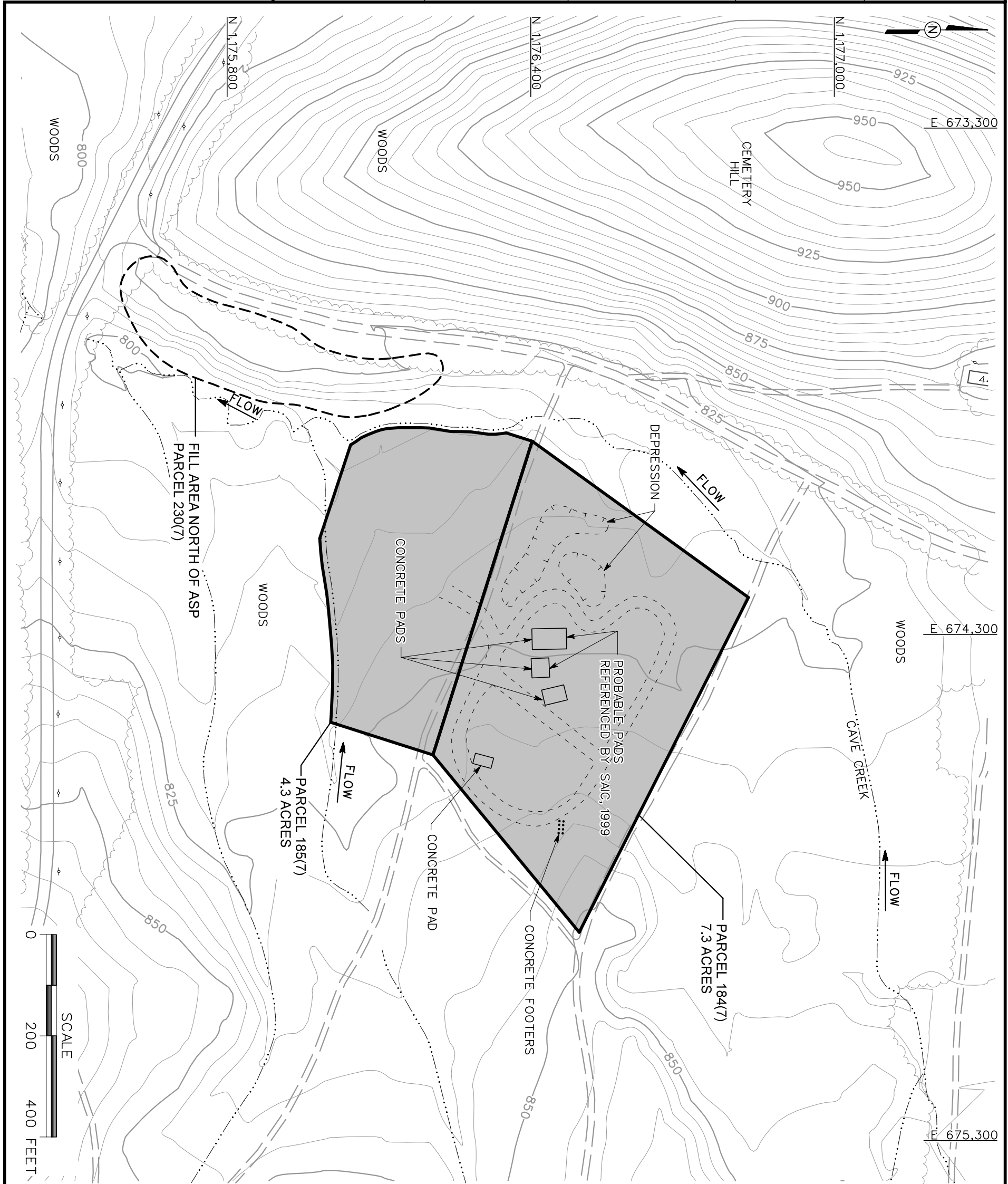
The U.S. Army is conducting studies of the environmental impact of suspected contaminants at Fort McClellan (FTMC) in Calhoun County, Alabama, under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE has contracted IT Corporation (IT) to provide environmental services for the site investigation (SI) of the chemical warfare material (CWM) site, Training Area T-31, Parcels 184(7) and 185(7), under Delivery Order CK10, Contract Number DACA21-96-D-0018.

This site-specific field sampling plan (SFSP) attachment to the installation-wide sampling and analysis plan (SAP) (IT, 2000a) for FTMC has been prepared to provide technical guidance for sample collection and analysis at the Training Area T-31. This SFSP will be used in conjunction with the site-specific safety and health plan (SSHP) and site-specific unexploded ordnance (UXO) safety plan developed for Training Area T-31 and the installation-wide work plan (WP) (IT, 1998) and SAP. The SAP includes the installation-wide safety and health plan (SHP), waste management plan, ordnance and explosives management plan, and quality assurance plan (QAP). Site-specific hazard analyses are included in the SSHP and the site-specific UXO plan.

1.2 Site Description

Training Area T-31, Parcels 184(7) and 185(7) is located in the north-central area of the Main Post (Figures 1-1 and 1-2). Training Area T-31 is located north of the Fill Area North of the ASP, Parcel 230(7), and occupies approximately 12 acres (Figure 1-2). The site is in a valley bordered by Cemetery Hill to the west. This training area partly overlaps with historic firing ranges for 37 millimeter, small arms and machine guns. The site was used from 1957 to 1969 as a Technical Escort Reaction Area and currently has unrestricted access.

Training of Technical Escort personnel was reportedly conducted at Training Area T-31 using sarin (GB) and distilled mustard (HD) in quantities of 20 to 40 milliliters (Roy F. Weston, Inc. [Weston], 1990). Also, storage of unspecified CWM may also have occurred. The decontaminants supertropical bleach (STB) and decontamination solution No. 2 (DS2) may also have been used at Training Area T-31. Based on observations of piles of white powder during a visit by U.S. Army Environmental Hygiene Agency in December 1973, it was surmised STB was used as a decontaminant for HD (Parson Engineering Science, Inc. [Parsons], 1999). When the



LEGEND

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|---|--|
| UNIMPROVED ROADS AND PARKING | |
| PAVED ROADS AND PARKING | |
| BUILDING | |
| TOPOGRAPHIC CONTOURS
(CONTOUR INTERVAL - 5 FOOT) | |
| TREES / TREELINE | |
| PARCEL BOUNDARY | |
| BRIDGE | |
| CULVERT WITH HEADWALL | |
| SURFACE DRAINAGE / CREEK | |
| UTILITY POLE | |
| HISTORICAL FEATURES | |
| DEPRESSION | |

FIGURE 1-2
SITE MAP
TRAINING AREA T-31
PARCELS 184(7) AND 185(7)

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT MCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

chemical warfare training was deactivated in 1973, items used at the site were reportedly moved to Area T-38 (Parsons, 1999).

The historical aerial photography review revealed that there was activity in the area reportedly used for training. However, the review identified mostly trails or paths with one exception. One location, a cleared area with depressions, was identified as being a possible burial site based on its location with respect to the rest of the activity at the site. This cleared area also appeared during the time when this site was reportedly used for chemical training.

A site visit was conducted by Parsons in February 1999 (Parsons, 1999). Two concrete pads were located in approximately the same position as is shown on Figure 1-2. In addition, the remains of a structure located in the eastern portion of the site were found and may be related to the permanent tents that were reportedly used at the site. Several holes, as well as a disturbed area, were observed at the site, but their purpose is not known (Parsons, 1999).

Two locations have been reported for Training Area T-31 (Environmental Science and Engineering, Inc. [ESE], 1998). Previous reports identify one area located at Parcel 184(7) and cite storage of CWM in Igloo 14 or in Igloo 13 (ESE, 1998). The igloos are neither evident on the ground today (Science Applications International Corporation [SAIC], 1993), nor on aerial photos reviewed by the environmental baseline survey (EBS) team (ESE, 1998). However, igloos are present at the Ammunition Supply Point (ASP), located a short distance to the southeast. Long-time FTMC personnel report that CWM was stored in and dispensed from an igloo at the ASP, and from nearby Area T-38 (ESE, 1998). Binary CWM components were stored in Building 4416 (also known as Igloo 14, at the ASP) (ESE, 1998).

Retired FTMC personnel also report conducting CWM exercises at a second site close to the previously reported location of Training Area T-31. This site is identified as Parcel 185(7). One report indicated that the training occurred in a previously unidentified area measuring approximately 70 feet by 72 feet, but was not confirmed (ESE, 1998). The EBS team believes that details of the facility layout, location, and operations conducted at Training Area T-31 are in doubt and that activities associated with CWM training may have occurred at three areas. Two of the suspected areas are Parcels 184(7) and 185(7) at the Training Area T-31, as previously identified, and the third is the ASP (ESE, 1998).

The SI, conducted from 1991 through 1993 by SAIC, included a magnetometer survey over the site identified in historical records and photography (SAIC, 1993); however, no surface evidence of the former training area was visible. However, during the SI that started in 1991, the site was reported to be overgrown, but several pads and concrete structures were evident (SAIC, 1993). The geophysical survey indicated metallic debris scattered within and beyond the site boundaries. This data suggests burial of some items at this location (SAIC, 1993). The SI also included collection of soil, sediment, and surface water samples and field screening for CWM (HD and GB) and laboratory analysis for their breakdown products. Neither field screening for CWM and breakdown products, nor laboratory analysis detected any HD, GB, or degradation products in the shallow soil, sediment, or surface water samples.

The soils at Training Area T-31, Parcels 184(7) and 185(7) fall into the Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded (JeB2) (U.S. Department of Agriculture, 1961). The soils at this site are of the Jefferson series and typically consist of 1.5 feet to 4 feet of well-drained, strongly acid soils that occur in small areas on fans and on foot slopes in the Choccolocco, Colvin and Coldwater Mountains (U.S. Department of Agriculture, 1961). These soils have developed from old local alluviums that washed or sloughed from ridges of sandstone, shale, and Weisner quartzite. Shallow groundwater direction at the site is probably controlled by topography. The depth to bedrock typically ranges from 2 feet to greater than 4 feet. The depth to the water table for this series is usually greater than 20 feet.

This mapping unit is friable soil developed from old local alluvium on foot slopes and fans along ridges and mountains. The surface soil is dark-grayish-brown fine sandy loam, and the subsoil is yellowish-brown, light fine sandy clay. Fragments as large as 8 inches in diameter are on the surface and throughout the soil.

1.3 Scope of Work

The scope of work for activities associated with the SI at the Training Area T-31, Parcels 184(7) and 185(7), as specified by the statement of work (USACE, 1999), includes the following tasks:

- Develop the SFSP attachment.
- Develop the SSHP attachment.
- Develop the site-specific UXO safety plan.

- Conduct a surface and near-surface UXO survey over all areas to be included in the supplemental sampling effort for the purpose of UXO avoidance.
- Provide downhole UXO survey support for all intrusive drilling to determine buried downhole hazards for the purposes of UXO avoidance.
- Collect seven surface soil samples, seven subsurface soil samples, seven groundwater samples, four surface water samples, and four sediment samples to determine the absence or presence of hazardous, toxic, and radioactive waste contamination at Training Area T-31, Parcels 184(7) and 185(7) to provide data useful for supporting any future planned corrective measures and closure activities.
- Samples will be analyzed for the parameters listed in Section 4.6.

A USACE-Huntsville requirement for conducting work at CWM sites at FTMC is to use UXO anomaly avoidance techniques; therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at Training Area T-31. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purposes of UXO avoidance.

The site-specific UXO safety plan will be used to support investigation and construction activities at Training Area T-31 should indicate ordnance, explosives, and UXO be encountered and require avoidance or disposal.

At completion of the field activities and sample analyses, draft and final site investigation summary reports will be prepared to evaluate the absence or presence of potential site-specific chemicals (PSSC) at this site. SI sampling reports will be prepared in accordance with current U.S. Environmental (EPA), Region IV and Alabama Department of Environmental Management (ADEM) guidelines.

2.0 Summary of Existing Environmental Studies

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with U.S. Department of Defense (DOD) guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria.

1. Areas where no storage, release, or disposal (including migration) has occurred
2. Areas where only release or disposal of petroleum products has occurred
3. Areas of contamination below action levels
4. Areas where all necessary remedial actions have been taken
5. Areas of known contamination with removal and/or remedial action underway
6. Areas of known contamination where required response actions have not been taken
7. Areas that are not evaluated or require further evaluation.

The EBS was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA) (CERFA-Public Law 102-426) protocols and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, ADEM, U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Comprehensive Environmental Response, Compensation, and Liability Act -regulated facilities. Available historic maps and aerial photographs were reviewed to document historic land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Training Area T-31, Parcels 184(7) and 185(7), was identified as a Category 7 CERFA site. CERFA sites are parcels where site-specific chemicals were stored, and possibly released onto the site or to the environment, and/or were disposed of on site property. Category 7 CERFA sites

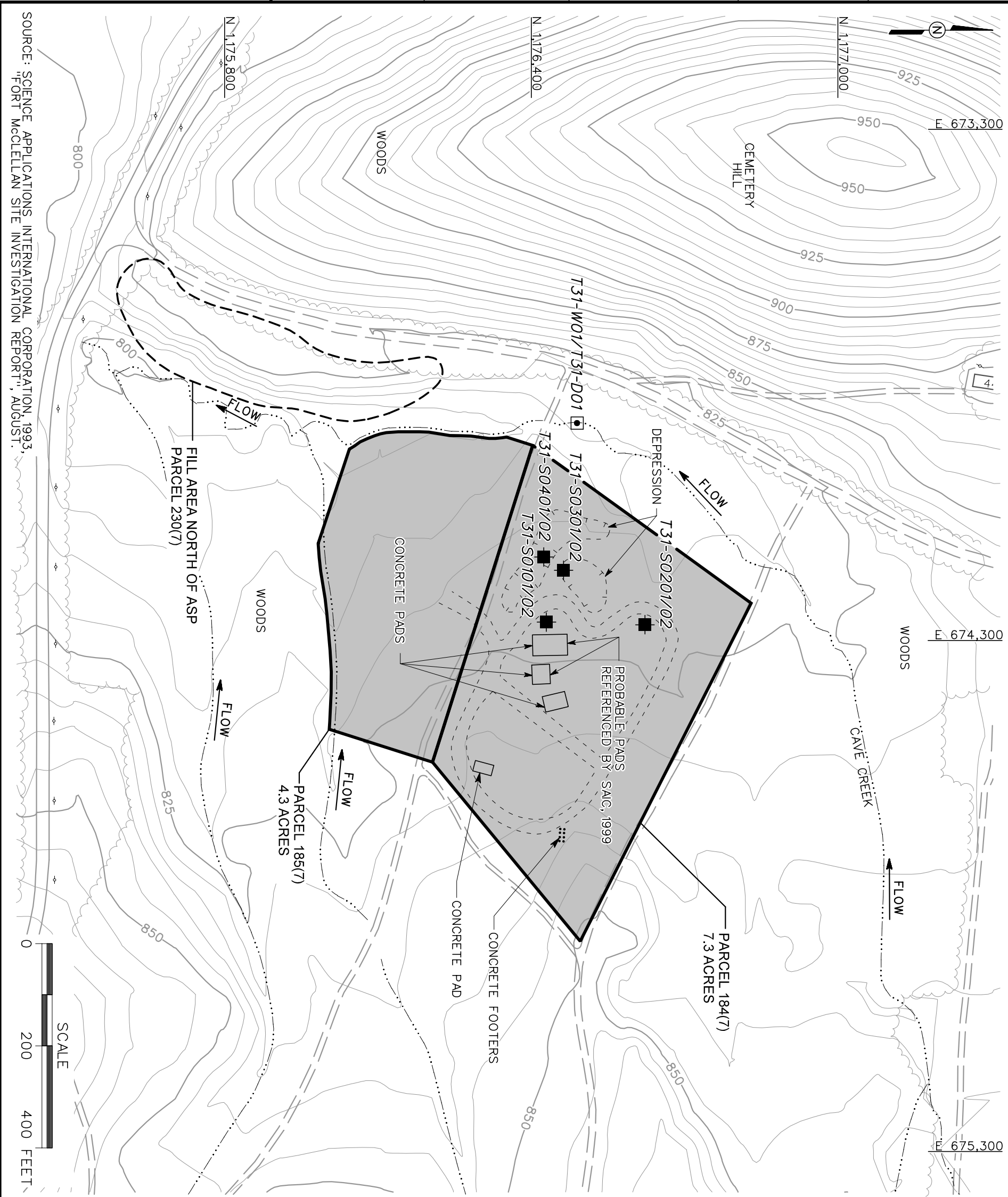
are areas that lack adequate documentation and, therefore, require additional evaluation to determine the environmental condition of the parcel.

Investigations and additional site studies have been conducted at Training Area T-31. Training Area T-31 is a former toxic training area used between 1957 and 1969 for training with small quantities of GB and HD and storage of unknown types of chemical agent. The available site map for this site is of marginal quality and the location of structures based on the map is qualitative (SAIC, 1993). The site was heavily overgrown during two site visits. The site was investigated by collecting and analyzing shallow soil samples from identified high probability areas and analysis of surface water and sediment samples downstream from the site (Figure 2-1).

Eight shallow soil samples were collected from four locations identified near existing decontamination structures and drainage features at Training Area T-31 by the U.S. Army Technical Escort Unit (SAIC, 1993) (Figure 2-1). The soil samples were screened onsite by U.S. Army Technical Escort Unit using a Miniature Continuous Air Monitoring System analyzer. The results of the sample screening are provided in Table 2-1. The field screening did not detect the presence of HD or GB chemical agent in concentrations above background in the collected samples. The values ranged between 0.0 and 0.04 time weighted average (TWA) and were below the 0.8 TWA threshold for the agents. The Miniature Continuous Air Monitoring System screening procedure and definition of the TWA concentration is included as Appendix A. Laboratory analysis of the screened soil samples did not detect the presence of HD or GB degradation products (SAIC, 1993). The results of the laboratory analyses are provided in Table 2-2.

Surface water and sediment samples were collected from a tributary of Cave Creek downstream from Training Area T-31 (Figure 2-1). Laboratory analysis of the samples for chemical agent breakdown products did not indicate the presence of these compounds at the sampled location (SAIC, 1993). The results of the laboratory analyses are provided in Tables 2-3 and 2-4.

Chemical analysis of soil, surface water, and sediment samples from high-probability locations at Training Area T-31 did not detect the presence of chemical agent or agent breakdown products at the site (SAIC, 1993).



LEGEND

UNIMPROVED ROADS AND PARKING

PAVED ROADS AND PARKING

BUILDING

TOPOGRAPHIC CONTOURS
(CONTOUR INTERVAL - 5 FOOT)

TREES / TREELINE

PARCEL BOUNDARY

BRIDGE

CULVERT WITH HEADWALL

SURFACE DRAINAGE / CREEK

UTILITY POLE

HISTORICAL FEATURES

SAIC SISUBSURFACE SOIL SAMPLE LOCATION

SAIC SISURFACE WATER/SEDIMENT SAMPLE LOCATION

DEPRESSION

FIGURE 2-1

SISAMPLE LOCATIONS

TRAINING AREA T-31

PARCELS 184(7) AND 185(7)

U. S. ARMY CORPS OF ENGINEERS

MOBILE DISTRICT

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CALHOUN COUNTY, ALABAMA

Contract No. DACA21-96-D-0018

IT CORPORATION

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Table 2-1

**USATEU Results of MINICAMS Screening
Training Area T-31, Parcel 184(7)^a
Fort McClellan, Calhoun County, Alabama**

Sample Number	Sample Depth (inches)	HD(TWA)^b	GB(TWA)^b
T31-S0101	11 - 14	0.04	0.0
T31-S0102	60 -63	0.0	0.0
T31-S0201	9 - 12	0.0	0.01
T31-S0202	57 -60	0.0	0.01
T31-S0301	10 - 13	0.0	0.0
T31-S0302	67 -70	0.0	0.0
T31-S0401	12 - 18	0.03	0.0
T31-S0402	67 -70	0.0	0.0

^aScience Applications International Corporation, 1993, *Fort McClellan Site Investigation Report*, August.

^bReported values are below the 0.8 time-weighted average (TWA) for the Miniature Continuous Air Monitoring System and are not indicative of detected chemical warfare agent (U.S. Army Technical Escort Unit, 6/92). See Appendix A for MINICAMS procedure and TWA definition.

HD - Distilled mustard.

GB - Sarin.

USATEU - U.S. Army Technical Escort Unit

MINICAMS - Miniature Continuous Air Monitoring System

Table 2-2

SI Soil Sample Results Summary^a
Training Area T-31, Parcel 184(7)
Fort McClellan, Calhoun County, Alabama

SAIC ID Number:				T31-S01	T31-S01 D	T31-S01	T31-S02	T31-S02
Depth BLS:				(1.0)	(1.0)	(5.0)	(1.0)	(5.0)
Collection Date:				04/22/1992	04/29/1992	04/22/1992	04/20/1992	04/20/1992
Associated Field QC Sample:				FAS001	FAS001	FAS001	FAS001	FAS001
				FMP002	FMP002	FMP002	FMP002	FMP002
				RB-004	RB-004	RB-004	RB-004	RB-004
Parameter	Units	CRL	UCR					
Method AAA9 (IMPA and MPA in Soil)								
Isopropylmethyl phosphonic acid	µg/g	2.10	40	2.10 LT	2.10 LT D	2.10 LT	2.10 LT	2.10 LT
Methyl phosphonic acid	µg/g	2.00	40	2.00 LT	2.00 LT D	2.00 LT	2.00 LT	2.00 LT
Method LL03 (Organosulfur Compounds in Soil)								
1,4 Oxathiane	µg/g	0.856	17.1	0.856 LT	0.856 LT D	0.856 LT	0.856 LT	0.856 LT
1,4-Dithiane	µg/g	1.47	11.3	1.47 LT	1.47 LT D	1.47 LT	1.47 LT	1.47 LT
p-Chlorophenylmethylsulfoxide	µg/g	2.25	45.0	2.25 LT	2.25 LT D	2.25 LT	2.25 LT	2.25 LT
p-Chlorophenylmethylsulfone	µg/g	2.37	47.4	2.37 LT	2.37 LT D	2.37 LT	2.37 LT	2.37 LT
Method LW18 (Thiodiglycol and Chloroacetic Acid in Soil)								
Thiodiglycol	µg/g	3.94	102	3.94 LT I	3.94 LT D	3.94 LT	3.94 LT	3.94 LT
Method TT9 (DIMP and DMMP in Soil)								
Di-isopropylmethylphosphonate	µg/g	0.114	4.57	0.114 LT	0.114 LT D	0.114 LT	0.114 LT	0.114 LT
Dimethylmethylphosphonate	µg/g	0.133	4.18	0.133 LT	0.133 LT D	0.133 LT	0.133 LT	0.133 LT

SAIC ID Number:				T31-S03	T31-S03	T31-S04	T31-S04
Depth BLS:				(1.0)	(5.0)	(1.0)	(5.0)
Collection Date:				04/22/1992	04/22/1992	04/22/1992	04/22/1992
Associated Field QC Sample:				FAS001	FAS001	FAS001	FAS001
				FMP002	FMP002	FMP002	FMP002
				RB-004	RB-004	RB-004	RB-004
Parameter	Units	CRL	UCR				
Method AAA9 (IMPA and MPA in Soil)							
Isopropylmethyl phosphonic acid	µg/g	2.10	40	2.10 LT	2.10 LT	2.10 LT	2.10 LT
Methyl phosphonic acid	µg/g	2.00	40	2.00 LT	2.00 LT	2.00 LT	2.00 LT
Method LL03 (Organosulfur Compounds in Soil)							
1,4 Oxathiane	µg/g	0.856	17.1	0.856 LT	0.856 LT	0.856 LT	0.856 LT
1,4-Dithiane	µg/g	1.47	11.3	1.47 LT	1.47 LT	1.47 LT	1.47 LT
p-Chlorophenylmethylsulfoxide	µg/g	2.25	45.0	2.25 LT	2.25 LT	2.25 LT	2.25 LT
p-Chlorophenylmethylsulfone	µg/g	2.37	47.4	2.37 LT	2.37 LT	2.37 LT	2.37 LT
Method LW18 (Thiodiglycol and Chloroacetic Acid in Soil)							
Thiodiglycol	µg/g	3.94	102	3.94 LT	3.94 LT	3.94 LT	3.94 LT
Method TT9 (DIMP and DMMP in Soil)							
Di-isopropylmethylphosphonate	µg/g	0.114	4.57	0.114 LT	0.114 LT	0.114 LT	0.114 LT
Dimethylmethylphosphonate	µg/g	0.133	4.18	0.133 LT	0.133 LT	0.133 LT	0.133 LT

^aScience Applications International Corporation, 1993, *Fort McClellan Site Investigation Report*, August.

CRL - Certified reporting limit.

D - Duplicate sample.

LT - Less than the certified reporting limit.

µg/g - Micrograms per gram.

UCR - Upper certified range.

I - Out of control, data rejected due to low recovery.

BLS - Below land surface.

Table 2-3

SI Surface Water Sample Results^a
Training Area T-31, Parcel 184(7)
Fort McClellan, Calhoun County, Alabama

SAIC ID Number:				T3-W01	T3-W01D	T3-W01D2
Depth:				(1.0)	(1.0)	(1.0)
Collection Date:				04/20/1992	04/20/1992	04/29/1992
Associated Field QC Sample:				N/A	N/A	N/A
				FAS001	FAS001	FAS001
				FMP002	FMP002	FMP002
				RB-004	RB-004	RB-007
Parameter	Units	CRL	UCR			
Method UT02 (IMPA and MPA in Water)						
Isopropylmethyl phosphonic acid	µg/L	100	9,000	100 LT	100 LT D	100 LT D
Methyl phosphonic acid	µg/L	128	9,000	128 LT	128 LT D	128 LT D
Method UL04 (Organosulfur Compounds in Water)						
1,4 Oxathiane	µg/L	1.98	39.5	1.98 LT	1.98 LT D	1.98 LT D
1,4-Dithiane	µg/L	1.11	22.2	1.11 LT	1.11 LT D	1.11 LT D
p-Chlorophenylmethylsulfoxide	µg/L	4.23	106	4.23 LT	4.23 LT D	4.23 LT D
p-Chlorophenylmethylsulfone	µg/L	4.72	106	4.72 LT	4.72 LT D	4.72 LT D
Method UW22 (TDGCL and TDGCLA in Water)						
Thiodiglycol	µg/L	48.8	4,880	48.8 LT	48.8 LT D	48.8 LT D
Method T8 (DIMP and DMMP in Water)						
Di-isopropylmethylphosphonate	µg/L	10.5	209.6	10.5 LT	10.5 LT D	10.5 LT D
Dimethylmethylphosphonate	µg/L	15.2	304.8	15.2 LT	15.2 LT D	15.2 LT D

^a Science Applications International Corporation, 1993, *Fort McClellan Site Investigation Report*, August.

D - Duplicate sample.

CRL - Certified reporting limit.

LT - Less than the certified reporting limit.

µg/L - Micrograms per liter.

UCR - Upper certified range.

Table 2-4

SI Sediment Sample Results^a
Training Area T-31, Parcel 184(7)
Fort McClellan, Calhoun County, Alabama

SAIC ID Number:				T-31-D01	T-31-D01D
Depth BLS:				(1.0)	(1.0)
Collection Date:				04/20/1992	04/20/1992
Associated Field QC Sample:				N/A	N/A
				FAS001	FAS001
				FMP002	FMP002
				RB-004	RB-004
Parameter	Units	CRL	UCR		
Method AAA9 (IMPA and MPA in Soil)					
Isopropylmethyl phosphonic acid	µg/g	2.1	40	2.10 LT	2.10 LT D
Methyl phosphonic acid	µg/g	2	40	2.00 LT	2.00 LT D
Method LL03 (Organosulfur Compounds in Soil)					
1,4-Oxathiana	µg/g	0.856	17.1	0.856 LT	0.856 LT D
1,4-Dithiane	µg/g	1.47	11.3	1.47 LT	1.47 LT D
p-Chlorophenylmethylsulfoxide	µg/g	2.25	45.0	2.25 LT	2.25 LT D
p-Chlorophenylmethylsulfone	µg/g	2.37	47.4	2.37 LT	2.37 LT D
Method LW18 (Thiodiglycol and Chloroacetic Acid in Soil)					
Thiodiglycol	µg/g	3.94	102	3.94 LT	3.94 LT D
Method TT9 (DIMP and DMMP in Soil)					
Di-isopropylmethylphosphonate	µg/g	0.114	4.57	0.114 LT	0.114 LT D
Dimethylmethylphosphonate	µg/g	0.133	4.18	0.133 LT	0.133 LT D

^aScience Applications International Corporation, 1993, *Fort McClellan Site Investigation Report*, August.

BLS - Below land surface.

CRL - Certified reporting limit.

LT - Less than the certified reporting limit.

µg/g - Micrograms per gram.

UCR - Upper certified range.

D - Duplicate sample.

3.0 Site-Specific Data Quality Objectives

3.1 Overview

The data quality objective (DQO) process is followed to establish data requirements. This process ensures that the proper quantity and quality of data are generated to support the decision-making process associated with the action selection for the Training Area T-31, Parcels 184(7) and 185(7). This section incorporates the components of the DQO process described in the publication EPA 540-R-93-071 *Data Quality Objectives Process for Superfund* (EPA, 1993). The DQO process as applied to Training Area T-31, Parcels 184(7) and 185(7) is described in more detail in Section 4.3 of the WP. Table 3-1 provides a summary of the factors used to determine the appropriate quantity of samples, and the procedures necessary to meet the objectives of the SI and establish a basis for any future action at Training Area T-31.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Chapter 4.0 in this SFSP and Table 6-1 in the QAP. Data will be reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah (CESAS) Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using Contract Laboratory Program (CLP)-like forms along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

3.2 Data Users and Available Data

The available data, presented in Table 3-1, related to the SI at Training Area T-31, Parcels 184(7) and 185(7) have been used to formulate a site-specific conceptual model. This conceptual model was developed to support the development of this SFSP, which is necessary to meet the objectives of these activities and to establish a basis for future action at the site. The data users for the data and information generated during field activities are primarily EPA, USACE, ADEM, FTMC, and the USACE supporting contractors. This SFSP, along with the necessary companion documents, has been designed to provide the regulatory agencies with sufficient detail to reach a determination as to the adequacy of the scope of work. The program has also been designed to provide the level of defensible data and information required to confirm or rule out the existence of residual chemical contamination in site media.

Table 3-1

**Summary of Data Quality Objectives
Site Investigation
Training Area T-31, Parcels 184(7) and 185(7)
Fort McClellan, Calhoun County, Alabama**

Potential Data Users	Available Data	Conceptual Site Model	Media of Concern	Data Uses and Objectives	Data Types	Analytical Level	Data Quantity
EPA, ADEM USACE, DOD FTMC, IT Corporation Other contractors, and possible future land users	Limited SI data from the SAIC Fort McClellan Site Investi- gation Report, August 1993	<u>Contaminant Source</u> Training Area T-31, Parcels 184(7) and 185(7)	<u>Surface soil</u>	SI to confirm the presence or absence of contamination in the site media	<u>Surface soil</u> TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products	Definitive data in CESAS Level B data packages	7 direct-push soil samples + QC
		<u>Migration Pathways</u> Infiltration to subsurface soil, infiltration and leaching to groundwater, biotransfer to deer through browsing, dust emissions and volatilization to ambient air, and runoff and erosion to surface water and sediment	<u>Subsurface Soil</u>				
			<u>Groundwater</u>	Definitive quality data for future decision- making	<u>Subsurface Soil</u> TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products	Definitive data in CESAS Level B data packages	7 direct-push soil samples + QC
			<u>Surface Water</u>				
			<u>Sediment</u>				
		<u>Potential Receptors</u> Recreational site user (current and future) construction workers (future), and residents (future)			<u>Groundwater</u> TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products	Definitive data in CESAS Level B data packages	7 groundwater samples + QC
		<u>PSSC</u> Decontamination materials, volatiles, semivolatiles, and metals			<u>Surface Water</u> TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products	Definitive data in CESAS Level B data packages	4 surface water samples + QC
					<u>Sediment</u> TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products TOC, and Grain Size	Definitive data in CESAS Level B data packages	4 sediment samples + QC

ADEM - Alabama Department of Environmental Management.
CESAS - Corps of Engineers South Atlantic Savannah.
CWM - Chemical warfare materials.
DOD - U.S. Department of Defense.
EPA - U.S. Environmental Protection Agency.
FTMC - Fort McClellan.

PSSC - Potential site-specific chemical.
QC - Quality control.
SAIC - Science Applications International Corporation.
SI - Site investigation.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.

TCL - Target Compound list.
TOC - Total organic carbon.
USACE - U.S. Army Corps of Engineers.
VOC - Volatile organic compound.

3.3 Conceptual Site Exposure Model

The CSEM provides the basis for identifying and evaluating the potential risks and hazards to human health in the risk assessment. The CSEM includes receptors and potential exposure pathways appropriate to all plausible scenarios. The CSEM facilitates consistent and comprehensive evaluation of human health through graphically presenting all possible exposure pathways, including sources, release and transport pathways, and exposure routes. In addition, the CSEM helps to ensure that potential pathways are not overlooked. The elements of a complete exposure pathway and CSEM are:

- Source (i.e., contaminated environmental) media
- Contaminant release mechanisms
- Contaminant transport pathways
- Receptors
- Exposure pathways.

Contaminant release mechanisms and transport pathways are not relevant for direct receptor contact with a contaminated source medium.

Primary contaminant releases were probably limited to leaks and spills that entered surface soil. However, burial of wastes is suspected at the site. Potential contaminant transport pathways include infiltration and leaching to subsurface soil and groundwater, biotransfer to deer through browsing, and dust emissions and volatilization to ambient air from surface soil and run off and erosion to surface water and sediment.

Currently the site is not utilized, has an overgrowth of vegetation and it is not fenced. A large wooded area of many acres surrounds the site; therefore people may trespass at the site and may hunt for deer. The only plausible receptor for the site with the current land-use is a recreational site user who may also hunt. Other potential receptors considered, but not included under current land-use scenarios, are the:

- **Groundskeeper.** The site is not currently maintained by a groundskeeper.
- **Construction Worker.** The site is unused, and no development or construction is occurring or scheduled.
- **Resident.** The site is not currently used for residential purposes.

Future land use in this area is shown as Remediation Reserve (FTMC, 1997) and will likely be used for passive recreation and open space. The site may not be deemed safe for public access until remediation has been completed because of the potential for UXO (FTMC, 1997). Plausible future land-use receptor scenarios addressed in the CSEM include:

- **Resident.** Although the site is expected to be used as open space and not be developed, the residential scenario is considered in order to provide information for the project manager and regulators.
- **Construction Worker.** Although the site is not expected to be developed in the near future, construction/demolition or maintenance of buried utilities may occur at some point in the future, thus this receptor is evaluated.
- **Recreational Site User.** The site may be planned for recreational use. Deer hunting is a potential exposure pathway for the recreational site user.

Human health receptor scenarios excluded from the CSEM include:

- **Groundskeeper.** The site is not likely to have areas that will need to be maintained in the future such as along roads and/or buildings.
- **Fish Consumption.** Fish consumption is not considered for the recreational site user receptor scenario because there is not sufficient surface water on the site to support fishing consumption.

A summary of relevant contaminant release and transport mechanisms, source and exposure media, and receptors and exposure pathways for this site is provided in Table 3-1 and Figure 3-1.

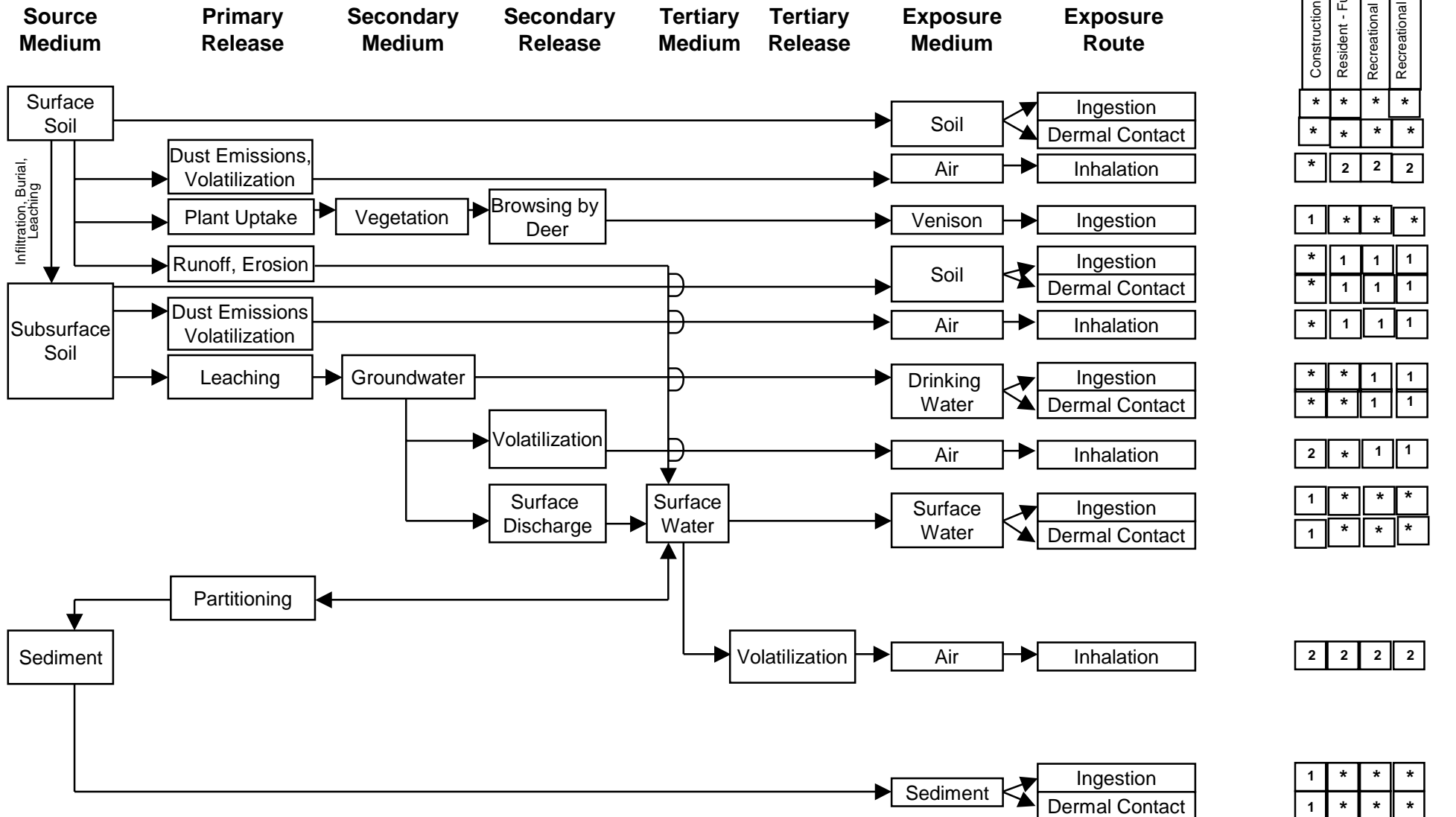
3.4 Decision-Making Process, Data Uses, and Needs

The decision-making process consists of a seven-step process that is presented in detail in Section 4.3 of the WP and will be followed during the SI at the Training Area T-31, Parcels 184(7) and 185(7). Data uses and needs are summarized in Table 3-1.

3.4.1 Risk Evaluation

Confirmation of contamination at the Training Area T-31, Parcels 184(7) and 185(7), will be based on using EPA definitive data with CESAS Level B data packages to determine whether or not PSSCs are detected in site media. Detected site chemical concentrations will be compared to site-specific screening levels developed in the *Final Human Health and Ecological Screening*

Figure 3-1
Human Health Conceptual Site Exposure Model
Training Area T-31, Parcels 184(7) and 185(7)
Fort McClellan, Calhoun County, Alabama



* = Complete exposure pathway evaluated in the streamlined risk assessment.

1 = Incomplete exposure pathway.

2 = Although theoretically complete, this pathway is judged to be insignificant and is not evaluated in the streamlined risk assessment.

Values and PAH Background Summary Report (IT, 2000b). Definitive data will be adequate for confirming the presence of site contamination and for supporting a feasibility study and risk assessment.

Assessment of potential ecological risk associated with sites or parcels (e.g., surface water and sediment sampling, specific ecological assessment methods, etc.) will be addressed in accordance with the procedures in the WP.

3.4.2 Data Types and Quality

Surface soil, subsurface soil, groundwater, surface water, and sediment will be sampled and analyzed to meet the objectives of the SI at Training Area T-31, Parcels 184(7) and 185(7). Quality assurance/quality control (QA/QC) samples will be collected for all sample types as described in Chapter 4.0 of this SFSP. Samples will be analyzed by EPA-approved SW-846 Methods Update III, where available; comply with EPA definitive data requirements; and be reported using hard copy data packages with electronic copies. In addition to meeting the quality needs of this SI, data analyzed at this level of quality are appropriate for all phases of the SI, feasibility study, and risk assessment.

3.4.3 Precision, Accuracy, and Completeness

Laboratory requirements of precision, accuracy, and completeness for this SI are provided in Section 9.0 of the QAP.

4.0 Field Activities

4.1 UXO and Chemical Warfare Agent Survey Requirements

A USACE-Huntsville requirement for conducting work at CWM sites at FTMC is to use UXO anomaly avoidance techniques; therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at Training Area T-31, Parcels 184(7) and 185(7). The surface sweeps and downhole surveys will be conducted to identify anomalies for the purposes of UXO avoidance. The site-specific UXO safety plan provides technical guidance for ordnance and explosives avoidance and construction activities for sample collection activities at Training Area T-31, Parcels 184(7) and 185(7). The site-specific UXO safety attachment has been written in conjunction with Appendix E of the SAP (IT, 2000a).

CWM sites are being investigated for chemical agents in soil by the USACE-Huntsville and Parsons (Parsons, 1999). When the USACE investigate these sites, they will use real-time analysis methods to screen the soil for the presence of chemical agents. If agents are not present, no additional air monitoring surveys will be required in these areas when IT collects the planned soil samples and installs the monitoring wells. The field activities described in this SFSP will not be conducted until after USACE-Huntsville has completed the investigation of the CWM sites. If USACE-Huntsville determines there are other potential sources at the site, IT will collect additional samples to address these sources.

4.1.1 Surface UXO Survey

A UXO sweep will be conducted over areas that will be included in the sampling and surveying activities to identify UXO on or near the surface that may present a hazard to on-site workers during field activities for the purposes of UXO avoidance. Low-sensitivity magnetometers will be used to locate surface and shallow-buried metal objects. UXO located on the surface will be identified and conspicuously marked for easy avoidance. Subsurface metallic anomalies will not be disturbed, and will also be marked for easy avoidance. UXO personnel requirements, procedures, and detailed descriptions of the geophysical equipment to be used are provided in Chapter 4.0 and Appendix E of the approved SAP (IT, 2000a).

4.1.2 Downhole UXO Survey

During the soil boring and downhole sampling, downhole UXO surveys will be performed to determine if buried metallic objects are present for the purposes of UXO avoidance. UXO monitoring, as described in Chapter 4.0 of the SAP (IT, 2000a), will continue until undisturbed

soils are encountered or the borehole has been advanced to 12 feet below ground surface, whichever is reached first.

4.2 Utility Clearances

After the UXO surface survey has cleared the area to be sampled and prior to performing any intrusive sampling, a utility clearance will be performed at locations where soil and groundwater samples will be collected, using the procedure outlined in Section 4.2.6 of the SAP (IT, 2000a). The site manager will mark the proposed locations with stakes, coordinate with the appropriate utility companies to clear the proposed locations for utilities, and obtain digging permits. Once the locations are approved (for both UXO and utility avoidance) for intrusive sampling, the stakes will be labeled as cleared.

4.3 Environmental Sampling

The environmental sampling program at the Training Area T-31, Parcels 184(7) and 185(7) includes the collection of surface soil, subsurface soil, groundwater, surface water, and sediment samples for chemical analyses. These samples will be collected and analyzed to provide data for characterizing the site to determine the environmental condition of the site and any further action to be conducted at the site. Additionally, samples will be collected from environmental media in locations that will assist in the assessment of potential ecological impacts resulting from activities at the site.

4.3.1 Surface Soil Sampling

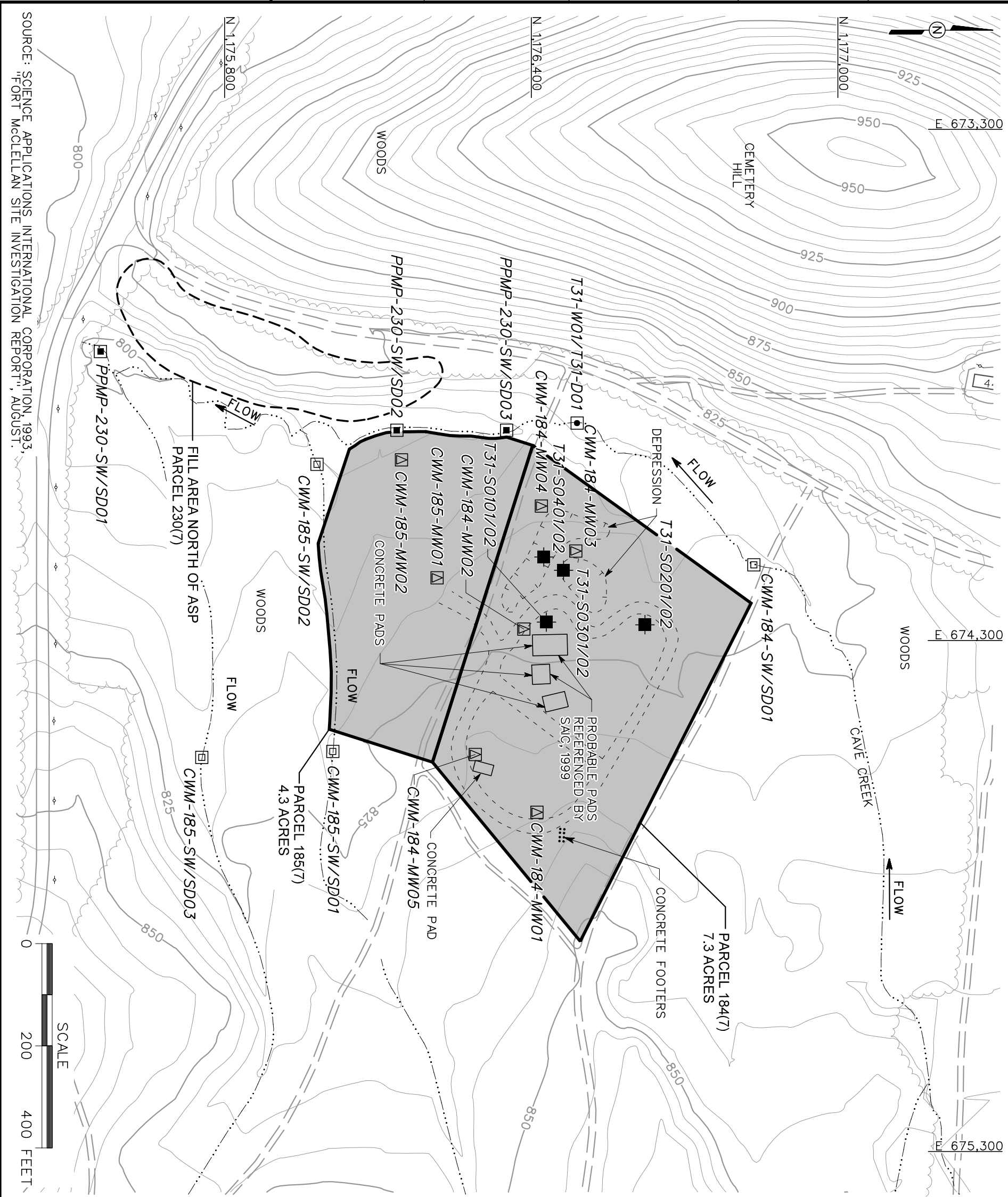
Surface soil samples will be collected from seven soil locations at Training Area T-31, Parcels 184(7) and 185(7).

4.3.1.1 Sample Locations and Rationale

The surface soil sampling rationale are listed in Table 4-1. Proposed sampling locations are shown in Figure 4-1. Surface soil sample designations and required QA/QC sample requirements are summarized in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field conditions.

4.3.1.2 Sample Collection

Surface soil samples will be collected from the upper 1 foot of soil by direct-push methodology as specified in Section 4.7.1.1 of the SAP (IT, 2000a). Collected soil samples will be screened using a photoionization detector (PID) in accordance with Section 4.15 of the SAP. Surface soil



LEGEND

UNIMPROVED ROADS AND PARKING

PAVED ROADS AND PARKING

BUILDING

TOPOGRAPHIC CONTOURS
(CONTOUR INTERVAL - 5 FOOT)

TREES / TREELINE

PARCEL BOUNDARY

BRIDGE

CULVERT WITH HEADWALL

SURFACE DRAINAGE / CREEK

UTILITY POLE

HISTORICAL FEATURES

SAIC, SI SURFACE SOIL SAMPLE LOCATION

SAIC, SI SURFACE WATER/SEDIMENT SAMPLE LOCATION

EXISTING SURFACE WATER/SEDIMENT SAMPLE LOCATION

PROPOSED SURFACE WATER/SEDIMENT SAMPLE LOCATION

PROPOSED GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION

DEPRESSION

FIGURE 4-1

PROPOSED SAMPLE LOCATIONS

TRAINING AREA T-31

PARCELS 184(7) AND 185(7)

U. S. ARMY CORPS OF ENGINEERS

MOBILE DISTRICT

FORT MCLELLAN

CALHOUN COUNTY, ALABAMA

Contract No. DACA21-96-D-0018

IT CORPORATION

A Member of The IT Group

Table 4-1

**Sampling Locations And Rationale
Training Area T-31, Parcels 184(7) and 185(7)
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Media	Sample Location Rationale
CWM-184-MW01	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater samples to be placed in the eastern area of Parcel 184 (7) and upgradient of most of the Training Area T-31. Sample data will indicate if contaminant releases into the environment have occurred upgradient of this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
CWM-184-MW02	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater samples to be placed south and downgradient of the concrete pads near the center of Parcel 184(7). Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
CWM-184-MW03	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater samples to be placed adjacent and south (downgradient) to the circular depression in the western section of Parcel 184(7). Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
CWM-184-MW04	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater samples to be placed adjacent and southwest (downgradient) of the elongated depression in the western section of Parcel 184(7). Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
CWM-184-MW05	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater samples to be placed adjacent and southwest (downgradient) of the concrete pad in the southeastern section of Parcel 184(7). Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
CWM-185-MW01	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater samples to be placed near the center of Parcel 185(7) at the end of a dirt road into the center of the parcel and downgradient of the center area of the site. Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
CWM-185-MW02	Surface soil, subsurface soil, and groundwater	Soil boring for surface soil, subsurface soil, and groundwater samples to be placed southwest downgradient of most of the Training Area T-31 in Parcel 185(7). Sample data will indicate if contaminant releases into the environment have occurred in this area and if contaminated soil exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer.
CWM-184-SW/SD01	Surface water and sediment	Sample location is Cave Creek outside the north corner of Parcel 184(7). Sample data will indicate if contaminant releases have occurred from runoff upstream of the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
CWM-185-SW/SD01	Surface water and sediment	Sample location is in the intermittent stream that flows southwest along the southern boundary of Parcel 185(7), east of the southeast corner of Parcel 185(7). Sample data will indicate if contaminant releases have occurred from runoff from upstream of the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
CWM-185-SW/SD02	Surface water and sediment	Sample location is in the intermittent stream that flows southwest along the southern boundary of Parcel 185(7), southwest of the southwestern corner of Parcel 185(7). Sample data will indicate if contaminant releases have occurred from runoff from upstream within the parcel. Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
CWM-185-SW/SD03	Surface water and sediment	Sample location is southeast of Parcel 185(7) on the intermittent stream that flows west to Cave Creek. Sample data will indicate if contaminant releases have occurred from runoff from upstream of Parcel 185(7). Sample data will also be used to assess potential impacts to aquatic biota in the stream and other ecological receptors that may utilize that stream for food and/or habitat purposes.
PPMP-230-SW/SD01	Surface water and sediment	Surface water and sediment sample location collected as part of the SI for Parcel 230(7). Samples will be evaluated with samples collected for the Training Area T-31.
PPMP-230-SW/SD02	Surface water and sediment	Surface water and sediment sample location collected as part of the SI for Parcel 230(7). Samples will be evaluated with samples collected for the Training Area T-31.
PPMP-230-SW/SD03	Surface water and sediment	Surface water and sediment sample location collected as part of the SI for Parcel 230(7). Samples will be evaluated with samples collected for the Training Area T-31.

Table 4-2

**Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Training Area T-31, Parcels 184(7) and 185(7)
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
CWM-184-MW01	CWM-184-MW01-SS-TL0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-184-MW01-DS-TL0002-REG	a			CWM-184-MW01-DS-TL0002-MS/MSD	
CWM-184-MW02	CWM-184-MW02-SS-TL0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-184-MW02-DS-TL0004-REG	a				
CWM-184-MW03	CWM-184-MW03-SS-TL0005-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-184-MW03-DS-TL0006-REG	a				
CWM-184-MW04	CWM-184-MW04-SS-TL0007-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-184-MW04-DS-TL0008-REG	a				
CWM-184-MW05	CWM-184-MW05-SS-TL0009-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-184-MW05-DS-TL0010-REG	a				
CWM-185-MW01	CWM-185-MW01-SS-TF0001-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-185-MW01-DS-TF0002-REG	a				
CWM-185-MW02	CWM-185-MW02-SS-TF0003-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals CWM Breakdown Products
	CWM-185-MW02-DS-TF0004-REG	a	CWM-185-MW02-DS-TF0005-FD	CWM-185-MW02-DS-TF0006-FS		

^a Actual sample depth selected for analysis will be at the discretion of the site geologist and will be based on field observation.

CWM - Chemical warfare material.

FD - Field duplicate.

FS - Field split.

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

REG - Field sample.

SVOC - Semivolatile organic compound.

TAL - Target analyte list.

TCL - Target compound list.

VOC - Volatile organic compound.

samples will be screened for information purposes only, and not to select samples for analysis. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1, of the QAP. Sample documentation and chain-of-custodies (COC) will be recorded as specified in Section 4.13 of the SAP. The samples will be analyzed for the parameters listed in Section 4.6 of this SFSP.

4.3.2 Subsurface Soil Sampling

Subsurface soil samples will be collected from the seven soil borings installed at Training Area T-31, Parcels 184(7) and 185(7).

4.3.2.1 Sample Locations and Rationale

Subsurface soil samples will be collected from the soil borings proposed on Figure 4-1. The subsurface soil sampling rationale is listed in Table 4-1. Subsurface soil samples to be collected are listed in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field observations and utility clearance results.

4.3.2.2 Sample Collection

Subsurface soil samples will be collected from soil borings at a depth greater than 1 foot below ground surface in the unsaturated zone. The soil borings will be advanced and soil samples collected using the direct-push sampling procedures specified in Section 4.7.1.1 of the SAP (IT, 2000a).

Soil samples will be collected continuously for the first 12 feet or until either groundwater or refusal is reached. A detailed lithological log will be recorded by the on-site geologist for each borehole. At least one subsurface sample from each borehole will be selected for analyses. The collected subsurface soil samples will be field-screened using a PID in accordance with Section 4.15 of the SAP to measure samples exhibiting elevated readings exceeding background (readings in ambient air). Typically, the subsurface soil sample showing the highest reading (above background) will be selected and sent to the laboratory for analysis. If none of the samples indicate readings exceeding background using the PID, the deepest interval from the soil boring will be sampled and submitted to the laboratory for analyses. Subsurface soil samples will be selected for analyses from any depth interval if the on-site geologist suspects PSSCs at the interval. Site conditions such as lithology may also determine the actual sample depth interval submitted for analyses. More than one subsurface soil sample will be collected if field measure-

ments and observations indicate a possible layer of PSSCs and/or additional sample data would provide insight to the existence of any PSSCs.

Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1 of the QAP. The samples will be analyzed for the parameters listed in Section 4.6 of this SFSP.

4.3.3 Permanent Residuum Monitoring Wells

Seven permanent residuum-monitoring wells will be installed at Training Area T-31, Parcels 184(7) and 185(7). The permanent residuum monitoring well locations are shown on Figure 4-1. The rationale for the monitoring well locations are presented in Table 4-1. The monitoring well boreholes will be drilled a minimum of 5 feet into the water bearing zone or to the top of bedrock whichever is first using a truck-mounted hollow-stem auger drill rig. The monitoring well casing will consist of new 2-inch inside-diameter, Schedule 40, threaded, flush-joint, polyvinyl chloride pipe. Attached to the bottom of the well casing will be a section of new threaded, flush-joint, 0.010-inch continuous wrap polyvinyl chloride well screen, approximately 10 to 20 feet long. The well will be installed so the well screen straddles the water table.

Soil samples for lithology will be collected every 5 feet to the total depth of the hole during hollow-stem auger drilling to provide a detailed lithologic log. The samples will be collected for lithology using a 24-inch-long, 2-inch-or-larger-diameter, split-spoon sampler. The soil borings will be logged in accordance with American Standard for Testing and Materials Method D 2488 using the Unified Soil Classification System. The soil samples will be screened in the field using a PID. The monitoring wells will be drilled, installed, and developed as specified in Section 4.8 and Appendix C of the SAP (IT, 2000a). The exact monitoring well locations will be determined in the field by the on-site geologist, based on actual field conditions.

4.3.4 Groundwater Sampling

Groundwater samples will be collected from the seven monitoring wells completed at Training Area T-31, Parcels 184(7) and 185(7) presented in Section 4.3.3.

4.3.4.1 Sample Locations and Rationale

Groundwater samples will be collected from the monitoring well locations shown on Figure 4-1. The groundwater sampling rationale is listed in Table 4-1. The groundwater sample designations, depths, and required QA/QC sample quantities are listed in Table 4-3.

4.3.4.2 Sample Collection

Prior to sampling monitoring wells, static water levels will be measured from each of the seven monitoring wells installed at the site to define the groundwater flow in the residuum aquifer. Water level measurements will be performed as outlined in Section 4.18 of the SAP (IT, 2000a). Groundwater samples will be collected in accordance with the procedures outlined in Section 4.9.1.4 of the SAP.

Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1 of the QAP (IT, 2000a). The samples will be analyzed for the parameters listed in Section 4.6 of this SFSP.

4.3.5 Surface Water Sampling

Four surface water samples will be collected from Training Area T-31, Parcels 184(7) and 185(7). Also, the collection of surface water samples was included in the SI for Parcel 230(7) that is southwest of the Training Area T-31. The samples for Parcel 230(7), shown on Figure 4-1, will be evaluated with the surface water samples proposed for the Training Area T-31.

4.3.5.1 Sample Locations and Rationale

The surface water sampling rationale are listed in Table 4-1. The surface water samples will be collected from the proposed locations on Figure 4-1. The surface water sample designations and required QA/QC sample requirements are listed in Table 4-4. The exact sampling locations will be determined in the field by the ecological sampler, based on drainage pathways and actual field observations.

4.3.5.2 Sample Collection

The surface water samples will be collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and

Table 4-3

**Groundwater Sample Designations and QA/QC Sample Quantities
Training Area T-31, Parcels 184(7) and 185(7)
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-184-MW01	CWM-184-MW01-GW-TL3001-REG	Groundwater	a			CWM-184-MW01-GW-TL3001-MS/MSD	TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-184-MW02	CWM-184-MW02-GW-TL3002-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-184-MW03	CWM-184-MW03-GW-TL3003-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-184-MW04	CWM-184-MW04-GW-TL3004-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-184-MW05	CWM-184-MW05-GW-TL3005-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-185-MW01	CWM-185-MW01-GW-TF3001-REG	Groundwater	a				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products
CWM-185-MW02	CWM-185-MW02-GW-TF3002-REG	Groundwater	a	CWM-185-MW02-GW-TF3003-FD	CWM-185-MW02-GW-TF3004-FS		TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products

^aSample depth will depend on where sufficient first water is encountered to collect a water sample.

CWM - Chemical warfare material.

FD - Field duplicate.

FS - Field split.

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

REG - Field sample.

SVOC - Semivolatile organic compound.

TAL - Target analyte list.

TCL - Target compound list.

VOC - Volatile organic compound.

Table 4-4

Surface Water and Sediment Sample Designations and QA/QC Sample Quantities
Training Area T-31, Parcels 184 (7) and 185(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
CWM-184-SW/SD01	CWM-184-SW/SD01-SW-TL2001-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-184-SW/SD01-SD-TL1001-REG	Sediment	0-0.5				
CWM-185-SW/SD01	CWM-185-SW/SD01-SW-TF2001-REG	Surface Water	N/A				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-185-SW/SD01-SD-TF1001-REG	Sediment	0-0.5				
CWM-185-SW/SD02	CWM-185-SW/SD02-SW-TF2002-REG	Surface Water	NA				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-185-SW/SD02-SD-TF1002-REG	Sediment	0-0.5	CWM-185-SW/SD02-SD-TF1003-FD			
CWM-185-SW/SD03	CWM-185-SW/SD03-SW-TF2003-REG	Surface Water	NA				TCL VOCs, TCL SVOCs, TAL Metals, CWM Breakdown Products (Also, TOC, Grain Size for sediment only)
	CWM-185-SW/SD03-SD-TF1004-REG	Sediment	0-0.5				

MS/MSD - Matrix spike/matrix spike duplicate.

NA - Not applicable.

QA/QC - Quality assurance/quality control.

REG - Field sample.

SVOC - Semivolatile organic compound.

TAL - Target analyte list.

TCL - Target compound list.

TOC - Total organic carbon.

VOC - Volatile organic compound.

holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1, of the QAP. The samples will be analyzed for the parameters listed in Section 4.6 of this SFSP.

4.3.6 Sediment Sampling

Four sediment samples will be collected from Training Area T-31, Parcels 184(7) and 185(7). These sediment samples will be collected at the same locations as the surface water samples described in Section 4.3.5. Also, the collection of sediment samples was included in the SI for Parcel 230(7) that is southwest of the Training Area T-31. The samples for Parcel 230(7), shown on Figure 4-1, will be evaluated with the sediment samples proposed for the Training Area T-31.

4.3.6.1 Sample Locations and Rationale

The proposed locations for the sediment samples are shown in Figure 4-1. Sediment sampling rationale is presented in Table 4-1. The sediment sample designation and required QA/QC sample requirements are listed in Table 4-4. The actual sediment sample points will be at the discretion of the ecological sampler, based on the drainage pathways and actual field observations.

4.3.6.2 Sample Collection

The sediment samples will be collected in accordance with the procedures specified in Section 4.9.1.2 of the SAP. Sediment samples for volatile organic analysis will be collected using EnCore sample collection devices. Sample documentation and COC will be recorded as specified in Section 4.13 of the SAP. The sediment samples will be analyzed for the parameters listed in Section 4.6 of this SFSP.

4.4 Decontamination Requirements

Decontamination will be performed on sampling and nonsampling equipment to prevent cross-contamination between sampling locations. Decontamination of sampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.1 of the SAP (IT, 2000a). Decontamination of nonsampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.2 of the SAP.

4.5 Surveying of Sample Locations

Sampling locations will be marked with pin flags, stakes, and/or flagging and will be surveyed using either global positioning system (GPS) or conventional civil survey techniques, as necessary to obtain the required level of accuracy. Horizontal coordinates will be referenced to the

U.S. State Plane Coordinate System, Alabama East Zone, North American Datum, 1983. Elevations will be referenced to the National Geodetic Vertical Datum of 1929 or the North American Vertical Datum of 1988 (soon to be established on site).

Horizontal coordinates for soil, sediment, and surface water locations will be recorded using a GPS to provide accuracy within 1 meter. Because of the need to use permanent monitoring wells to determine water levels, a higher level of accuracy is required. Monitoring wells will be surveyed to an accuracy of 0.1 foot for horizontal coordinates and 0.01 foot for elevations, using survey-grade GPS techniques and/or conventional civil survey techniques, as required. Procedures to be used for GPS surveying are described in Section 4.3 of the SAP. Conventional land survey requirements are presented in Section 4.19 of the SAP. All areas at this site must be cleared for UXO avoidance before any surveying activities will commence.

4.6 Analytical Program

Samples collected at locations specified in this chapter of this SFSP will be analyzed for the specific suites of chemicals and elements based on the history of site usage, as well as EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected from the Training Area T-31, Parcels 184(7) and 185(7), consist of the following list of analytical suites:

- ⊗ Target Compound List Volatile Organic Compounds - Method 5035/8260B
- ⊗ Target Compound List Semivolatile Organic Compounds - Method 8270C
- ⊗ Target Analyte List Metals - Method 6010B/7000.
- ⊗ Chemical Agent Breakdown Products- Methods 8270M/8321.

In addition, the sediment samples will be analyzed for the following list of parameters:

- ⊗ Total Organic Carbon - Method 9060
- ⊗ Grain Size - ASTM D-421/D-422.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Table 4-5 in this SFSP and Table 6-1 in the QAP. Data will be reported and evaluated in accordance with CESAS Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using CLP-like forms. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

Table 4-5

Analytical Samples
Training Area T-31, Parcels 184(7) and 185(7)
Fort McClellan, Calhoun County, Alabama

Parameters	Analysis Method	Sample Matrix	TAT Needed	Field Samples			QA/QC Samples ^(a)					Quanterra	QA Lab
				No. of Sample Points	No. of Events	No. of Field Samples	Field Dups (10%)	Splits w/ QA Lab (5%)	MS/MSD (5%)	Trip Blank (1/ship)	Eq. Rinse (1/wk/matrix)	Total No. Analysis	Total No. Analysis
Training Area T-31: 11 water matrix samples (7 groundwater samples and 4 surface water samples); 18 soil matrix samples (7 surface soil samples, 7 subsurface soil samples, 4 sediment samples)													
TCL VOCs	8260B	water	normal	11	1	11	1	1	1	3	1	18	1
TCL SVOCs	8270C	water	normal	11	1	11	1	1	1		1	15	1
Tot TAL Metals	6010B/7000	water	normal	11	1	11	1	1	1		1	15	1
CWM BD Products ^(b)	8270/8321	water	normal	11	1	11	1	1	1		1	15	1
TCL VOCs	8260B	soil	normal	18	1	18	2	1	1	4	1	27	1
TCL SVOCs	8270C	soil	normal	18	1	18	2	1	1		1	23	1
TAL Metals	6010B/7000	soil	normal	18	1	18	2	1	1		1	23	1
CWM BD Products ^(b)	8270/8321	soil	normal	18	1	18	2	1	1		1	23	1
TOC	9060	sediment	normal	4	1	4						4	0
Grain Size	ASTM D-421/D-422	sediment	normal	4	1	4						4	0
Training Area T-31:						124	12	8	8	7	8	167	8

^aField duplicate, QA split, and MS/MSD samples were calculated as a percentage of the field samples collected per site and were rounded to the nearest whole number.

Trip blank samples will be collected in association with water matrix samples for VOC analysis only. Assumed four field samples per day to estimate trip blanks. Equipment blanks will be collected once per event whenever sampling equipment is field decontaminated and re-used. They will be repeated weekly for sampling events that are anticipated to last more than 1 week. Assumed 20 field samples will be collected per week to estimate number of equipment blanks.

^bChemical Warfare Material Breakdown Products - include Method 8270 (Modified): 1,4-oxathiane, 1,4-dithiane, p-chlorophenylmethylsulfoxide, p-chlorophenylmethylsulfone; Method 8321: thiodiglycol, IMPA, EMPA, MPA, DIMP, and DMMP.

Ship samples to:

EMAX Laboratories, Inc.
630 Maple Avenue
Torrance, California 90503
Attn: Elizabeth McIntyre
Tel: 310-618-8889
Fax: 310-618-0818

USACE Laboratory split samples
are shipped to:

U.S. Army Engineer District, Savannah
Environmental & Materials District
Attn: Sample Receiving
200 North Cobb Parkway
Building 400, Suite 404
Marietta, Georgia 30062
Tel: 678-354-0310

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

SVOC - Semivolatile organic compound.

TAL - Target analyte list.

TCL - Target compound list.

TOC - Total organic carbon.

VOC - Volatile organic compound.

4.7 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping will follow the procedures specified in Section 4.13.2 of the SAP (IT, 2000a). Completed analysis request/COC records will be secured and included with each shipment of coolers to:

Attn: Elizabeth McIntyre
EMAX Laboratories, Inc.
630 Maple Avenue
Torrance, California 90503
Telephone: (310) 618-8889.

QA split samples collected for the USACE laboratory will be shipped to the following address:

U.S. Army Engineer District, Savannah
Environmental & Materials Unit
Attn: Sample Receiving
200 North Cobb Parkway
Building 400, Suite 404
Marietta, Georgia 30062
Telephone: (678) 354-0310.

4.8 Investigation-Derived Waste Management

Management and disposal of the investigation-derived wastes (IDW) will follow procedures and requirements as described in Appendix D of the SAP (IT, 2000a). The IDW expected to be generated at Training Area T-31, Parcels 184(7) and 185(7) will include decontamination and well development fluids, drill cuttings, and disposable personal protective equipment. The IDW will be staged in the fenced area surrounding Buildings 335 and 336 while awaiting final disposal.

4.9 Site-Specific Safety and Health

Health and safety requirements for this SI are provided in the SSHP attachment for the Training Area T-31, Parcels 184(7) and 185(7). The SSHP attachment will be used in conjunction with the installation-wide SHP.

5.0 Project Schedule

The project schedule for the SI activities will be provided by the IT project manager to the Base Realignment and Closure Cleanup Team and will be in accordance with the WP.

6.0 References

Environmental Science and Engineering, Inc. (ESE), 1998, ***Final Environmental Baseline Survey, Fort McClellan, Alabama***, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

Fort McClellan (FTMC), 1997, ***Fort McClellan Comprehensive Reuse Plan***, Fort McClellan Reuse and Redevelopment Authority of Alabama, prepared under contract to the Calhoun County Commission, November.

IT Corporation (IT), 2000a, ***Final Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama***, March.

IT Corporation (IT), 2000b, ***Final Human Health and Ecological Screening Values and PAH Background Summary Report***, July.

IT Corporation (IT), 1998, ***Final Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama***, August.

Parsons Engineering Science, Inc. (Parsons), 1999, ***Draft-Final Work Plan/Site Safety Submission, Chemical Warfare Material Site EE/CA, Fort McClellan, Alabama***, March

Science Applications International Corporation (SAIC), 1993, ***Fort McClellan Site Investigation Report***, August.

U.S. Army Corps of Engineers (USACE), 1999, ***Statement of Work for Task Order CK10, Remedial Investigations(RIs) at the Chemical Warfare Material Sites, RIs at the Fuel/ Training Areas, RIs at the Print Plants/Motor Pools, RIs at the Ground Scars/Boiler Plants, RI at Range 24A, Site investigations (SIs) at the Historic Ranges, and a Groundwater Investigation at Rideout Field at Fort McClellan, Alabama***, June.

U.S. Army Corps of Engineers (USACE), 1994, ***Requirements for the Preparation of Sampling and Analysis Plan***, Engineer Manual EM 200-1-3, September 1.

U.S. Department of Agriculture (USDA), 1961, ***Soil Survey, Calhoun County, Alabama***, Soil Conservation Service, Series 1958, No. 9, September 1961.

U.S. Environmental Protection Agency (EPA), 1993, ***Data Quality Objectives Process for Superfund, Interim Final Guidance***, EPA 540-R-93-071, September.

Roy F. Weston, Inc. (Weston), 1990, ***Final USATHAMA Task Order 11, Enhanced Preliminary Assessment, Fort McClellan, Anniston, Alabama***, prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, December.

ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

Abs	skin absorption
AC	hydrogen cyanide
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
ADEM	Alabama Department of Environmental Management
AEL	airborne exposure limit
AL	Alabama
amb.	Amber
ANAD	Anniston Army Depot
APT	armor piercing tracer
ASP	Ammunition Supply Point
ASR	Archives Search Report, July 1999
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
B	analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCT	BRAC Cleanup Team
BFB	bromofluorobenzene
bgs	below ground surface
bkg	background
bls	below land surface
BOD	biological oxygen demand
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BTEX	benzene, toluene, ethylbenzene, and xylenes
BTOC	below top of casing
BZ	breathing zone
C	ceiling limit value
Ca	carcinogen
CCAL	continuing calibration
CCB	continuing calibration blank
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CFC	chlorofluorocarbon
CG	cyanogen chloride
ch	inorganic clays of high plasticity
CK	carbonyl chloride
cl	inorganic clays of low to medium plasticity
Cl.	chlorinated
CLP	Contract Laboratory Program
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
COC	chain of custody

COE	Corps of Engineers
Con	skin or eye contact
CRL	certified reporting limit
CRZ	contamination reduction zone
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare materials, clear wide mouth
CX	dichloroformoxime
D	duplicate
DANC	decontamination agent, non-corrosive
°C	degrees Celsius
°F	degrees Fahrenheit
DDT	dichlorodiphenyltrichloroethane
DEP	depositional soil
DI	deionized
DIMP	di-isopropylmethylphosphonate
DMMP	dimethylmethylphosphonate
DOD	U.S. Department of Defense
DP	direct-push
DPDO	Defense Property Disposal Office
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
E&E	Ecology and Environment, Inc.
EBS	environmental baseline survey
Elev.	elevation
EM	electromagnetic
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive and ordnance disposal
EODT	explosive and ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
ER	equipment rinsate
ESE	Environmental Science and Engineering, Inc.
ESV	ecological screening value
E-W	east to west
EZ	exclusion zone
FB	field blank
FD	field duplicate
FedEx	Federal Express, Inc.
FFE	field flame expedient
Fil	filtered
Flt	filtered

FMP 1300	Former Motor Pool 1300 Site
Frtn	fraction
FS	field split
ft	feet
ft/ft	feet per foot
FTA	fire training area
FTMC	Fort McClellan
g	gram
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
GFAA	graphite furnace atomic absorption
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
Herb.	herbicides
HNO ₃	nitric acid
hr	hour
H&S	health and safety
HSA	hollow stem auger
HTRW	hazardous, toxic, and radioactive waste
I	out of control, data rejected due to low recovery
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDW	investigation-derived waste
IMPA	isopropylmethyl phosphonic acid
in.	inch
Ing	ingestion

List of Abbreviations and Acronyms (Continued)

Inh	inhalation	ND	not detected	qty	quantity
IP	ionization potential	NE	no evidence	Qual	qualifier
IPS	International Pipe Standard	NFA	No Further Action	R	rejected
IRDMIS	Installation Restoration Data Management Information System	ng/L	nanograms per liter	RCRA	Resource Conservation and Recovery Act
IT	IT Corporation	NGVD	National Geodetic Vertical Datum	ReB3	Rarden silty clay loams
ITEMS	IT Environmental Management System TM	NIC	notice of intended change	REG	field sample
J	estimated concentration	NIOSH	National Institute for Occupational Safety and Health	REL	recommended exposure limit
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded	No.	number	RFA	request for analysis
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded	NOAA	National Oceanic and Atmospheric Administration	RI	remedial investigation
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes	NR	not requested	RL	reporting limit
K	conductivity	ns	nanosecond	RPD	relative percent difference
L	lewisite; liter	N-S	north to south	RRF	relative response factor
LC ₅₀	lethal concentration for 50 percent of population tested	nT	nanotesla	RSD	relative standard deviation
LD ₅₀	lethal dose for 50 percent of population tested	NTU	nephelometric turbidity unit	RTK	real-time kinematic
l	liter	O&G	oil and grease	SAD	South Atlantic Division
LCS	laboratory control sample	OD	outside diameter	SAE	Society of Automotive Engineers
LEL	lower explosive limit	OE	ordnance and explosives	SAIC	Science Applications International Corporation
LT	less than the certified reporting limit	oh	organic clays of medium to high plasticity	SAP	installation-wide sampling and analysis plan
max	maximum	ol	organic silts and organic silty clays of low plasticity	sc	clayey sands; sand-clay mixtures
MDL	method detection limit	OP	organophosphorus	Sch.	schedule
mg/kg	milligrams per kilogram	OSHA	Occupational Safety and Health Administration	SD	sediment
mg/L	milligrams per liter	OWS	oil/water separator	SDG	sample delivery group
mg/m ³	milligrams per cubic meter	oz	ounce	SDZ	safe distance zone
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils	PAH	polynuclear aromatic hydrocarbon	SEMS	Southern Environmental Management & Specialties
MHz	megahertz	Pb	lead	SFSP	site-specific field sampling plan
µg/g	micrograms per gram	PCB	polychlorinated biphenyl	SGF	standard grade fuels
µg/kg	micrograms per kilogram	PCE	perchlorethene	SHP	installation-wide safety and health plan
µg/L	micrograms per liter	PDS	Personnel Decontamination Station	SI	site investigation
µmhos/cm	micromhos per centimer	PEL	permissible exposure limit	sm	silty sands; sand-silt mixtures
min	minimum	Pest.	pesticide	SOP	standard operating procedure
MINICAMS	miniature continuous air sampling system	PG	professional geologist	sp	poorly graded sands; gravelly sands
ml	inorganic silts and very fine sands	PID	photoionization detector	SP	sump pump
mL	milliliter	PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes	Ss	stony rough land, sandstone series
mm	millimeter	POL	petroleum, oils, and lubricants	SS	surface soil
MOGAS	motor vehicle gasoline	PP	peristaltic pump	SSC	site-specific chemical
MPA	methyl phosphonic acid	ppb	parts per billion	SSHO	site safety and health officer
MR	molasses residue	PPE	personal protective equipment	SSHP	site-specific safety and health plan
MS	matrix spike	ppm	parts per million	SSSL	site-specific screening level
mS/cm	milliSiemens per centimeter	PPMP	Print Plant Motor Pool	STB	supertropical bleach
MSD	matrix spike duplicate	ppt	parts per thousand	STEL	short-term exposure limit
msl	mean sea level	PSSC	potential site-specific chemical	STOLS	Surface Towed Ordnance Locator System [®]
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded	pt	peat or other highly organic silts	Std. units	standard units
mV	millivolts	PVC	polyvinyl chloride	SU	standard unit
MW	monitoring well	QA	quality assurance	SVOC	semivolatile organic compound
N/A	not applicable; not available	QA/QC	quality assurance/quality control	SW	surface water
NAD	North American Datum	QAP	installation-wide quality assurance plan	SW-846	U.S. EPA <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>
NAD83	North American Datum of 1983	QC	quality control	SZ	support zone
NAVD88	North American Vertical Datum of 1988	QST	QST Environmental Inc.	TAL	target analyte list

List of Abbreviations and Acronyms (Continued)

TAT	turn around time
TB	trip blank
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
TIC	tentatively identified compounds
TLV	threshold limit value
TN	Tennessee
TOC	top of casing, total organic carbon
TPH	total petroleum hydrocarbons
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TWA	time weighted average
UCL	upper confidence limit
UCR	upper certified range
UJ	not detected above reporting limit; result should be estimated
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USAMCLS	U.S. Army Chemical School
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validated qualifier
VX	nerve agent (O-ethyl-S- [diisopropylaminoethyl]-methylphosphonothiolate)
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd ³	cubic yards

APPENDIX A

MINICAMS SCREENING PROCEDURE (SAIC Remedial Investigation Report, Fort McClellan, Alabama, August, 1995)

MINICAMS Screening Procedure^a

The Miniature Continuous Air Monitoring System (MINICAMS) units were operated by two U.S. Army Technical Escort Unit (USATEU) teams according to their Standard Operating Procedure (SOP). The MINICAMS units obtain a time weighted average (TWA) concentration by analyzing vapors produced by thermal desorption from a soil sample. The thermal desorption was effected by heating each sample to approximately 70 degrees Fahrenheit (°F) in a controlled environment. The relationship between the concentration of chemical warfare agent (CWA) detected in the desorbed vapor sample and the concentration of CWA contained in the soil is variable and depends on the lithology, moisture content, and pH of the soil sample. In general, more CWA vapor is recovered from coarse soils than from fine-grained soils at an optimum moisture content that varies with soil type (Sage and Howard, 1989). TWA concentrations for distilled mustard (HD), sarin (GB), and nerve agent (VX) are established by the Surgeon General of the United States and are shown below:

Agent	TWA* (mg/m ³)	TWA* (ng/L)	MINICAMS Detection Limit* (relative units)
HD	.003	3	1
GB	.0001	0.1	.005
VX	.00001	0.01	.005

*Data provided by CMS Research Corporation (1993, written communication SAIC, 1995).

The MINICAMS system is normally set up to report concentrations in relative units. For example, if a concentration of 0.003 milligrams per cubic meter (mg/m³) of HD is detected by the MINICAMS, it is reported as 1.00 TWA in relative units. If a concentration of 0.00001 mg/m³ of VX is detected, it is reported as 1.00 TWA. Thus, the TWA reading has the same significance no matter which agent is being detected. The TWA reading reported for a given agent may be converted to mg/m³ simply by multiplying the reported TWA reading by the definition given above. For example, a reading of 0.5 TWA for GB corresponds to 0.00005 mg/m³.

Ideally, the unit will report a concentration reading of 1.00 TWA each time the proper quantity of agent is injected into the MINICAMS after calibration. The alarm level for the MINICAMS is set to correspond to a 95 percent confidence level, which would sound an alarm if the instrument was challenged with the equivalent of 1.00 TWA of agent. Statistical studies have shown that an alarm level of 0.80 TWA is a suitable setpoint for the MINICAMS to achieve a 95 percent

confidence level. A 1.00 TWA challenge of the MINICAMS will result in a concentration reading greater than or equal of 0.80, 95 percent of the time, resulting in an alarm.

The following procedure was used to analyze soil samples using a MINICAMS unit at Fort McClellan:

- Approximately 50 grams of soil were collected with a decontaminated stainless-steel spoon trowel, or hand auger; deposited into a stainless-steel bowl; homogenized; and placed into a glass jar. Upon retrieval of a split-spoon sample, the soil in the tip of the sampler was removed with a stainless-steel spoon and placed into a glass jar.
- The soil sample was placed into the heater box (uncapped) and heated to the required minimum temperature of 70°F. Evolved vapors were collected through Teflon™ tubing attached to the heater box and were introduced directly into the MINICAMS unit. Once the MINICAMS reported the sample clear of CWA, the soil sample was removed, disposed of onsite, and the results logged by USATEU. Each sample was equilibrated in the heater box at the same temperature, for the same duration, and with approximately equal volume in each soil sample container.
- USATEU also conducted continuous air monitoring with the MINICAMS units during intrusive activities (i.e., drilling and trenching). The heater lines were placed as close to the borehole or test pit as conditions allowed. The soil vapors released by the intrusive activity were purged through the heater lines, adsorbed onto the trap, and desorbed into the column of the MINICAMS. The results of each cycle were logged by USATEU.

G.W. Sage and P.H. Howard, 1989, *Environmental Fate Assessments of Chemical Agents HD and VX*, Chemical Research, Development, and Engineering Center, U.S. Army Armament Munitions Chemical Compound, CRDEC-CR-034, p. 33, June.

Science Applications International Corporation, 1995, *Draft Fort McClellan Remedial Investigation Report*, August.